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**PATENT**



Attorney Docket No. 2000.34

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of:  
C. Glen Wensley

Art Unit: 1746

Serial No. 09/851,479

Examiner: M. Wills

Filed: May 8, 2001

For: SEPARATOR FOR POLYMER BATTERY

APPEAL BRIEF

Mail Stop Appeal Brief-Patents  
Commissioner for Patents  
P. O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

This Appeal Brief is filed in reply to the Office Action  
mailed August 24, 2004 (Paper No. 13).

The fees required under Section 1.17(b) are dealt with in the  
Transmittal accompanying this Appeal Brief. This Brief is

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1. REAL PARTY IN INTEREST

Celgard Inc. is the real party in interest as the assignee of record in the instant application.

2. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

3. STATUS OF THE CLAIMS

Claims 1-8 and 10-20 are pending in this application. Claim 9 has been cancelled. Claims 1, 10, and 19 have been amended. Claims 1-8 and 10-20 are subject to the instant appeal.

4. STATUS OF AMENDMENTS

The claims were not amended after the Final Office Action.

5. SUMMARY OF THE INVENTION

The following is a concise explanation of the invention defined in the claims. Claims 1-8 and 10-18 are product claims covering a battery separator. Claims 19-20 are process claims for making a battery separator.

Batteries having gel polymer electrolytes or solid polymer electrolytes are known. It has been suggested that microporous membranes can be used in the assembly of polymer electrolyte

batteries. Separators, i.e., coated microporous membranes, designed specifically for use in such batteries are known. See U.S. Patent Application Serial No. 09/016,024 filed January 30, 1998, and WO 99/54953 claiming priority of April 20, 1998.

There is a desire on the part of some battery manufacturers to move from liquid electrolytes to gel or solid electrolytes. One reason for this move is that cells made with gel or solid electrolytes may be moldable in to a variety of shapes. Another reason is to prevent the leakage of the electrolyte. This move, however, has been hindered by the fact that the conductivity of the gel or solid electrolyte is much less than that of the liquid electrolyte. To compensate for the lower conductivity of the gel and solid electrolytes, thinner electrolytes are required. Thinner electrolytes, however, are detrimental to the manufacture of the batteries because of their low mechanical strength. Accordingly, battery manufacturers have had to compromise. That compromise is the inclusion of a microporous membrane in the electrolyte. Inclusion of the microporous membrane has enabled the manufacture of these batteries. Gozdz, *Ibid*. At first, it was suggested that the gel-forming polymer should fill the pores of the membrane. See U.S. Patent Nos. 5,639,573; 5,681,357; 5,688,293; 5,716,421; 5,750,284; 5,837,015; and 5,853,916. Later, it was suggested that

the gel-forming polymer should partially fill the pores of the membrane. See PCT WO 99/54953.

Although, these separators perform well, there is still a need to continue to improve the conductivity of these coated separators for gel or polymer batteries.

Referring to the instant specification, the invention is a separator for a lithium polymer battery. The separator comprises a membrane and a coating. The membrane has a first surface, a second surface, and a plurality of micropores extending from the first surface to the second surface. The coating covers the membrane, but does not fill the plurality of micropores. **The coating comprises a gel-forming polymer and a plasticizer in a weight ratio of 1:0.5 to 1:3.** The resulting separator has a surface density of 0.4 to 0.9 mg/cm<sup>3</sup>.

## 6. ISSUES

Whether claims 1-3, 10, 11, 13-14 and 17-20 are anticipated under Section 102(e) over Pekala et al., (U.S. Patent No. 6,586,138). Whether claim 8 is obvious under Section 103(a) over Pekala et al., (U.S. Patent No. 6,586,138). Whether claims 4, 5-7 and 12 are obvious under Section 103(a) over Pekala et al., (U.S. Patent No. 6,586,138) in view of Gozdz et al., (U.S. Patent

5,418,091). And whether claims 15-16 are obvious under Section 103(a) over Pekala et al., (U.S. Patent No. 6,586,138) in view of Kurauchi et al., (U.S. Patent 5,691,047).

7. GROUPING OF CLAIMS

Claims 1-8 and 10-20 stand together as a group.

8. ARGUMENT

The Section 102(e) rejection based on Pekala et al. is improper and must be removed. The error made by the Examiner is discussed after a discussion of the invention. The Section 103(a) rejections based on Pekala et al., Pekala in view of Gozdz and Pekala in view of Kurauchi, are improper and must be removed. The error made by the Examiner is discussed after a discussion of the invention.

The Invention

The invention is directed to a battery separator, in particular to battery separators for a lithium polymer battery. The separator comprises a membrane and a coating. The membrane has a first surface, a second surface, and a plurality of micropores extending from the first surface to the second surface. The coating covers the membrane, but does not fill the plurality of micropores. **The coating comprises a gel-forming polymer and a**

**plasticizer in a weight ratio of 1:0.5 to 1:3.** The resulting separator has a surface density of 0.4 to 0.9 mg/cm<sup>3</sup>.

The prior art teaches coated microporous membranes, designed specifically for use in such batteries. Generally the coating is mixed with a solvent and applied to a microporous membrane; the solvent is allowed to flash off leaving a separator which is a coated microporous membrane.

The instant invention differs from the prior art in that the "membrane is coated with a solution of gel forming polymer, plasticizer and solvent." Specification, page 10, lines 9-11. **The coating comprises a gel-forming polymer and a plasticizer in a weight ratio of 1:0.5 to 1:3.** The resulting separator has a surface density of 0.4 to 0.9 mg/cm<sup>3</sup>. Only the instant invention teaches a membrane coated with a solution of gel forming polymer, plasticizer and solvent, where the **weight ratio of gel-forming polymer to plasticizer is 1:0.5 to 1:3.**

#### Discussion of the Examiner's Error

The Examiner has misconstrued Pekala et al., (U.S. Patent No. 6,586,138). The Examiner avers that Pekala anticipates the present invention under 35 USC § 102(e). This is not true.

To anticipate a claim, a single source must contain all of the elements of the claim. See *Hybritech Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1379, 231 USPQ 81, 90 (Fed. Cir. 1986); *Atlas Powder Co. v. E.I. du Pont De Nemours & Co.*, 750 F.2d 1569, 1574, 224 USPQ 409, 411 (Fed. Cir. 1984); *In re Marshall*, 578 F.2d 301, 304, 198 USPQ 344, 346 (C.C.P.A. 1978). Missing elements may not be supplied by the knowledge of one skilled in the art or the disclosure of another reference. See *Structural Rubber Prods. Co. v. Park Rubber Co.*, 749 F.2d 707, 716, 223 USPQ 1264, 1271 (Fed. Cir. 1984). Where a reference discloses less than all of the claimed elements, an Examiner may only rely on 35 USC § 103. See *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 780, 227 USPQ 773, 777 (Fed. Cir. 1985).

Pekala et al., USP No. 6,586,138 teaches that a gel forming polymer is dissolved in a solvent that allows the formation of a homogenous solution (Pekala, column 5, lines 32-33). The resulting gel-forming polymer solution is then coated on at least one major surface of the UHMWPE web (Pekala, column 5, lines 43-44). After the coating has been applied and the coating solution cooled on the web, the solvent is allowed to evaporate, resulting in a microporous PVDF layer (Pekala, column 5, lines 57-61).

Nowhere in Pekala is it taught or suggested to coat a membrane with a solution of gel forming polymer, **plasticizer** and solvent where the weight ratio of gel-forming polymer to plasticize is 1:0.5 to 1:3. This is only taught by the instant application.

The Examiner avers that because Pekala teaches that carbonates can be one of the solvents used, and because the Instant Application teaches that carbonates can be used as a plasticizer somehow Pekala anticipates the instant invention. The Examiner ignores that Pekala teaches that a solvent is added to the gel-forming polymer to create a coating which is applied and then the solvent is allowed to flash off leaving the gel forming polymer coating. Further the Examiner ignores that Pekala does teach use of plasticizers in forming the UHMWPE web and these are listed as including paraffinic oil, napthenic oil and aromatic oil.

Now using **improper hindsight reconstruction** with the **Instant Application as the blueprint** the Examiner turns to the features of the Instant Invention, a solution of gel forming polymer and **plasticizer**, where the weight ratio of gel-forming polymer to plasticize is 1:0.5 to 1:3, and claims that this is disclosed in the Pekala reference. To show this the Examiner points to Example 3 which teaches 20g of EAA copolymer emulsion is mixed with 10g



water and 10g isopropanol to form a homogenous coating solution. The Examiner again, using the Instant Application as a blueprint, comes up with EAA as a gel forming polymer and isopropanol (as a plasticizer?) and water as a solvent. No where in Pekala is it taught or suggested to use a plasticizer in the homogenous coating solution yet here it is. A person of ordinary skill in the art would consider both the water and isopropanol as solvent based on the teachings of Pekala. In fact in Pekala, (Example 3, column 8, lines 30-32) clearly characterizes the blend of water with isopropanol as the solvent blend. Pekala does talk about plasticizers, but these are oils used in the formation of the UHMWPE web. So how does the Examiner justify the classification of isopropanol as a plasticizer? Why by looking at Menon US Patent 5,894,656. The Board is reminded that this is a rejection under 35 USC §102(e) as being anticipated by Pekala, to anticipate a claim, a single source must contain all of the elements of the claim. See *Hybritech Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1379, 231 USPQ 81, 90 (Fed. Cir. 1986); *Atlas Powder Co. v. E.I. du Pont De Nemours & Co.*, 750 F.2d 1569, 1574, 224 USPQ 409, 411 (Fed. Cir. 1984); *In re Marshall*, 578 F.2d 301, 304, 198 USPQ 344, 346 (C.C.P.A. 1978). Missing elements may not be supplied by the knowledge of one skilled in the art or the disclosure of another reference. See *Structural Rubber Prods. Co. v. Park Rubber Co.*, 749 F.2d 707, 716, 223 USPQ 1264, 1271 (Fed. Cir. 1984). Where a

reference discloses less than all of the claimed elements, an Examiner may only rely on 35 USC § 103. See *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 780, 227 USPQ 773, 777 (Fed. Cir. 1985).

Now even if the Examiner were correct in the assertion that Example 3 of Pekala does show a coating comprising a gel-forming polymer a solvent and a plasticizer, and from the arguments above that is doubtful, this argument still must fail. The Examiner says that 20g EAA polymer and 10g of isopropanol (plasticizer?) show a ratio polymer to plasticizer of 1:0.5. What the Examiner selectively chooses to ignore is that a few lines later in Example 3 is that the "coating web was then placed in a circulating oven for approximately 20 seconds at 110° C to evaporate the **solvent mixture**." (Pekala, column 5, lines 30-32). Of this mixture of solvents isopropanol has a boiling point of 82.4°C more than 17°C lower than water so that when the solvent mixture is heated the isopropanol should evaporate before the water. Therefore if as the Examiner has pointed out, there is a residual in this Example, one would expect residual to be water (solvent) and not the isopropanol. Therefore this argument must fail.

In the section of the Official Action, dated August 24, 2004, entitled "Response to Arguments" (page 7, lines 18-20) the Examiner

argues that: "Pekala teaches that the membrane contains residual plasticizer (col.6, lines 30-35) and does not specify that all the plasticizer is removed. Hence residual plasticizer may embrace a weight ratio of 1:0.5 to 1:3." As Applicant has already pointed out the plasticizer referred to in column 6, lines 30-35, is the plasticizer taught in Pekala in Column 6 lines 14-27, which is contained in the UHMWPE web and has nothing to do with the coating. This reference to plasticizer as taught in Pekala has nothing to do with the solvents taught in column 5, lines 32-43. The Pekala reference does not teach or suggest that any residual solvent in the coating, in fact he teaches just the opposite that, the solvent is allowed to evaporate off. For a rejection under 35 USC §102(e) to anticipate a claim, a single source (Pekala) must contain all of the elements of the claim. Pekala neither teaches nor suggests **a coating comprises a gel-forming polymer and a plasticizer in a weight ratio of 1:0.5 to 1:3** therefore the rejections to all the claims is improper and the rejection must be withdrawn.

Accordingly, Pekala does not anticipate Claims 1-3, 10, 11 13-14 and 17-20 of the Instant Invention.

### §103(a) Rejection

The rejections under 35 USC § 103(a) based on Pekala et al., claim 8, Pekala in view of Gozdz, claims 4-7 and 12, and Pekala in view of Kurauchi, claims 15-16 are all improper and must be removed. The error made by the Examiner is discussed below.

In the rejection of Claim 8 based on Pekala et al. the Examiner avers that Pekala teaches a gel-forming polymer and a plasticizer in the weight ratio of 1:0.5, this is not true. Using **improper hindsight reconstruction** with the **Instant Application as the blueprint** the Examiner tries to reconstruct the features of the Instant Application: of a solution of gel forming polymer and **plasticizer** where the weight ratio of gel-forming polymer to plasticize is 1:0.5 to 1:3; and then claims that this is disclosed in the Pekala reference. To show this the Examiner points to Example 3 which teaches 20g of EAA copolymer emulsion is mixed with 10g water and 10g isopropanol to form a homogenous coating solution. The Examiner again using the Instant Application as a blueprint, comes up with 20g of EAA as a gel forming polymer and 10g isopropanol (and claims without support, is a plasticizer) and 10g water as a solvent. Nowhere in Pekala is it taught or suggested to use a plasticizer in the homogenous coating solution yet here it is inserted by the Examiner. A person of ordinary

skill in the art could consider both the water and isopropanol as solvent based on the teachings of Pekala. In fact in Pekala, Example 3, column 8, lines 30-32, clearly characterizes the blend of water with isopropanol as "the solvent blend." Pekala does talk about plasticizers, but these are oils used in the formation of the UHMWPE web as set forth in Pekala, column 6, lines 14-27, and clearly have no bearing on "the formation of a homogenous solution" (Pekala, column 5, line 32-33 and column 8, lines 15-23).

The Federal Circuit has repeatedly warned that the requisite motivation must come from the prior art, not applicant's specification. See *In re Dow Chem. Co.*, 837 F.2d 469, 473, 5 USPQ2d 1529, 1531-1532 (Fed. Cir. 1988). "There must be a reason or suggestion in the art for selecting the procedure used, other than the knowledge learned from the applicant's disclosure." Using an Applicant's disclosure as a blueprint to reconstruct the claimed invention from isolated pieces of the prior art contravenes the statutory mandate section 103 of judging obviousness at the point in time when the invention was made. See *Grain Processing Corp. v. American Maize-Prods. Co.*, 840 F.2d 902, 907, 5 USPQ2d 1788, 1792 (Fed. Cir. 1988).

As claim 1 is neither anticipated nor obvious from Pekala, claim 8 which depends from claim 1 is not obvious either.

The rejection of claims 4-7 and 12 based Pekala in view of Gozdz under 35 USC § 103(a) is improper. For the reasons given above claim 1 is neither anticipated nor obvious from Pekala. Therefore, claims 4-7 and 12 which all depend on or through claim 1 are equally allowable with claim 1. Claims 4-7 and 12 cannot be obvious from Pekala in view of Gozdz under 35 USC § 103(a).

The rejection of claims 15-16, based Pekala in view of Kurauchi under 35 USC § 103(a) is improper. For the reasons given above claim 1 is neither anticipated nor obvious from Pekala. Therefore, claims 15-16 which all depend on or through claim 1 are equally allowable with claim 1. Claims 15-16 cannot be obvious from Pekala in view of Gozdz under 35 USC § 103(a).

#### Simplified Comparison

The simplest way to see the difference between the two inventions is to look at the resulting end products.

Pekala teaches a **microporous polymer web** which may have residual plasticizers selected from the group of paraffinic oil, napthenic oil and aromatic oil, which is coated with a coating consisting of a **gel-forming polymer material**.

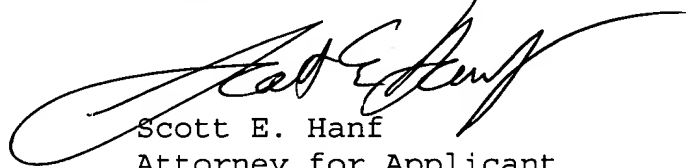
The Instant invention teaches a **microporous membrane** which may or may not have some residual plasticizer, which is coated with a coating comprising a **gel-forming polymer material** and a **plasticizer** where the weight ratio of gel-forming polymer to plasticizer is 1:0.5 to 1:3.

It should be clear to anyone of ordinary skill in the art that the Instant Invention is both distinctive and patentable over the Pekala reference.

Conclusion

In view of the foregoing, Appellant respectfully requests that the rejection be overturned and that the instant application be allowed to proceed to issuance.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Scott E. Hanf', with a long, sweeping horizontal line extending to the right.

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SERIAL NO. 09/851,479  
ART UNIT 1746

APPENDIX

1. (previously presented) A separator for a lithium polymer battery comprising:

a membrane having a first surface, a second surface, and a plurality of micropores extending from the first surface to the second surface;

a coating, the coating covering the membrane, but not filling the plurality of micropores, the coating comprising a gel-forming polymer and a plasticizer in a weight ratio of 1:0.5 to 1:3, and having a surface density of 0.4 to 0.9 mg/cm<sup>2</sup>.

2. (original) The separator of claim 1 wherein the coating covers the first surface and the second surface.

3. (original) The separator of claim 1 wherein the gel-forming polymer is a copolymer of polyvinylidene fluoride.

4. (original) The separator of claim 3 wherein the comonomer content of the polyvinylidene fluoride copolymer comprises about 3-20% by weight.

5. (original) The separator of claim 4 wherein the comonomer content comprises about 7 to 15% by weight.

6. (original) The separator of claim 4 wherein the comonomer is selected from the group consisting of hexafluoropropylene, octofluoro-1-butene, octofluoroisobutene, tetrafluoroethylene, and mixtures thereof.

7. (original) The separator of claim 6 wherein the copolymer of polyvinylidene fluoride is polyvinylidene fluoride: hexafluoropropylene in which the hexafluoropropylene comprises about 9% by weight.

8. (original) The separator of claim 1 wherein the ratio is 1:2.

9. (canceled)

10. (previously presented) The separator of claim 1 wherein the coating has a surface density of 0.55 to 0.7 mg/cm<sup>2</sup>.

11. (original) The separator of claim 1 wherein the plasticizer is selected from the group of phthalate-based esters, cyclic carbonates, polymeric carbonates, and mixtures thereof.

12. (original) The separator of claim 11 wherein the phthalate based esters includes dibutyl phthalate.

13. (original) The separator of claim 11 wherein the cyclic carbonates are selected from the group consisting of ethylene carbonate, propylene carbonate, butylene carbonate, and mixtures thereof.

14. (original) The separator of claim 1 wherein the membrane is a single layer microporous membrane.

15. (original) The separator of claim 1 wherein the membrane is a multi-layered microporous membrane.

16. (original) The separator of claim 15 wherein the membrane is a tri-layer separator having a polypropylene/polyethylene/polypropylene structure.

17. (original) The separator of claim 1 wherein the membrane is a shutdown membrane.

18. (original) The separator of claim 1 wherein the membrane contains an ultra high molecular weight polyethylene.

19. (previously presented) A method of making a separator for a lithium polymer battery comprising the steps of:

providing a microporous membrane having a plurality of micropores;

providing a solution, the solution comprising a gel-forming polymer, a plasticizer, and a solvent, the solution concentration being > 1% by weight;

coating the solution onto the membrane to have a surface density of 0.4 to 0.9 mg/cm<sup>2</sup>;

driving off the solvent of the solution; and

forming thereby a coating covering the membrane, but not filling the plurality of micropores.

20. (original) The method of claim 19 wherein the solution concentration ranges from about 2 to 4% by weight.